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Chemicals in Hand Sanitizers, Disinfectants May Harm Children's Brain Development

Researchers at Case Western Reserve University in Ohio found quaternary compounds, or QACs, were damaging to oligodendrocytes, a type of glial cell in the central nervous system, including the brain and spinal cord.

By **Dr. Joseph Mercola**

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Story at a glance:

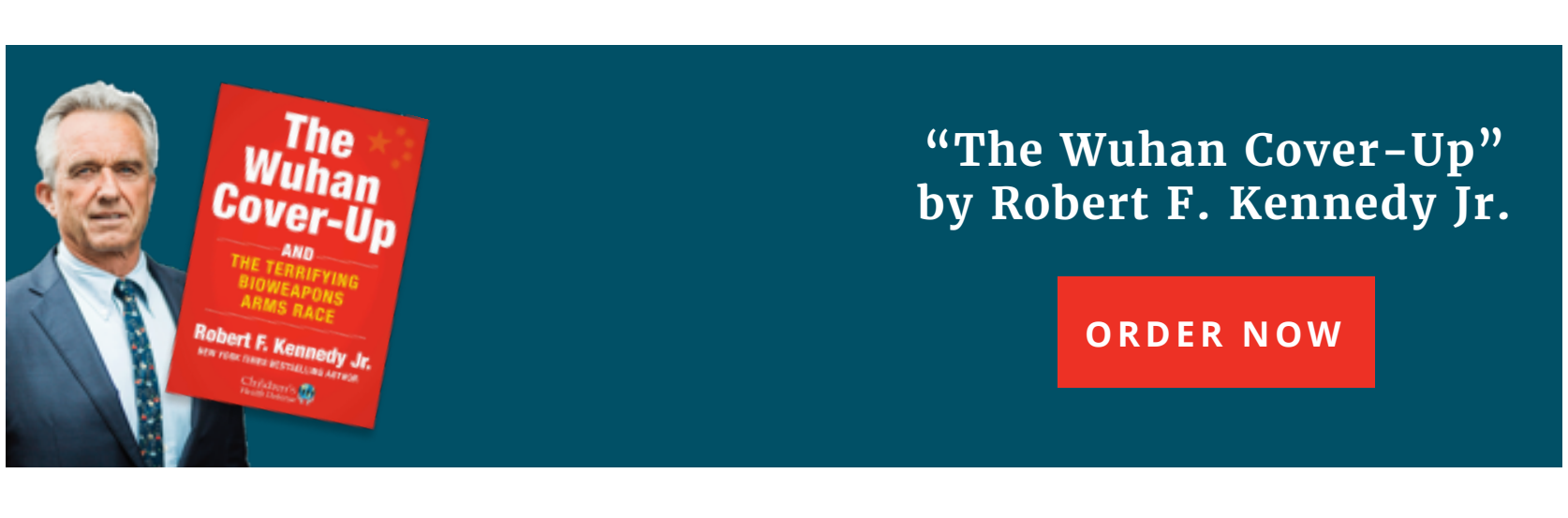
- Toxic chemicals found in hand sanitizers and other disinfectants, as well as household items like furniture and electronics, could be harming brain development in children.
- Researchers at Case Western Reserve University in Ohio found quaternary compounds, or QACs, were damaging to oligodendrocytes, a type of glial cell in the central nervous system, including the brain and spinal cord.
- After 10 daily doses of a QAC called cetylpyridinium chloride — starting just five days after birth — mice had reduced numbers of oligodendrocytes in their brains
- Typically, oligodendrocytes keep developing from before birth into adulthood, but the study suggests QACs may kill them.
- The researchers also analyzed levels of the flame retardant metabolite, or BDCIPP, in children, revealing those with the highest levels were more likely to experience adverse neurodevelopmental outcomes.

Toxic chemicals found in hand sanitizers and other disinfectants, as well as household items like furniture and electronics, could be harming brain development in children and future generations.

This includes QACs — used widely in disinfecting agents — and organophosphate flame retardants, which are found in many household items.

Researchers at Case Western Reserve University in Ohio found QACs were damaging to oligodendrocytes, a type of glial cell in the central nervous system, including the brain and spinal cord, while flame retardants increased the risk of neurodevelopmental problems.

Both chemical classes are widespread in the environment, raising the risk of population-wide health risks.



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Hand sanitizer compound may harm brain development

QACs or quats, are a popular ingredient in hand sanitizers and disinfectant wipes. Usage of both products has increased significantly in recent years.

Clorox increased production of its disinfectant wipes to 1.5 million packs per day during the pandemic, while an industry trade group survey found 83% of households had used disinfectant wipes at least one time in the past week and 92% of consumers had used a cleaning, disinfecting or sanitizing wipe.

Use of hand sanitizers also rose during the pandemic, with usage as high as 25 times per day in children and more than nine times daily for adults.

You may also be exposed to QACs in a number of other common products, including wood preservatives, mouthwash, detergents, shampoos, fabric softeners, eye drops and herbicides.

The cumulative effects of such exposures are unknown, but in a study on mouse pups, researchers found the chemicals in the animals' brain tissues just days after administering an oral dose.

Not only does this suggest that QACs cross the blood-brain barrier, but they may also cause damage to oligodendrocytes in the brain.

Oligodendrocytes play an important role in forming the myelin sheath, a fatty layer that surrounds the axons of nerve cells. This myelin sheath is essential for the fast transmission of electrical signals, allowing for efficient communication within the nervous system.

Damage to oligodendrocytes, which act similarly to insulation around electrical wires, can lead to several neurological disorders, including multiple sclerosis.

After 10 daily doses of a QAC called cetylpyridinium chloride — starting just five days after birth — the mice had reduced numbers of oligodendrocytes in their brains.

Study author Paul Tesar noted:

> "Loss of oligodendrocytes underlies multiple sclerosis and other neurological diseases. We now show that specific chemicals in consumer products can directly harm oligodendrocytes, representing a previously unrecognized risk factor for neurological disease."

The scientists also tested QACs in brain organoids, which are three-dimensional cell cultures used as a model for studying brain development and disease mechanisms. Similar damage was found.

Typically, oligodendrocytes keep developing from before birth into adulthood, but the study suggests QACs may kill them.

"We found that oligodendrocytes — but not other brain cells — are surprisingly vulnerable to quaternary ammonium compounds and organophosphate flame retardants," study author Erin Cohn said in a news release.

"Understanding human exposure to these chemicals may help explain a missing link in how some neurological diseases arise."

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QACs also linked to immune system, respiratory and reproductive adverse effects

When you use QAC-containing products like cleansers, disinfectants, personal care items and more, you can be exposed by ingesting the chemicals, inhaling them or absorbing them through your skin.

Beyond damage to brain cells, QACs are also linked to multiple adverse health outcomes including:

- Dermal (skin) and respiratory effects.
- Developmental and reproductive toxicity.
- Disruption of metabolic function such as lipid homeostasis.
- Impairment of mitochondrial function.

The National Pesticide Information Center states that children should not use antimicrobial wipes because they contain QACs, and children are more likely to have higher rates of exposure due to putting their hands in their mouths.

Separate research found the chemicals also contribute to antimicrobial resistance and pollute the environment, including causing acute and chronic toxicity to aquatic organisms.

Writing in Environmental Science & Technology, researchers explained that QACs are a "chemical class of emerging concern":

> "QAC use is increasing, without high-quality evidence of their effectiveness in reducing transmission of infectious disease in many settings and applications. …
>
> "Meanwhile, greater indoor usage is consistent with higher indoor exposure, which is a concern given the recent discovery of adverse health outcomes in laboratory animals at relatively low (ambient) exposure concentrations.
>
> "Increased production and usage is anticipated to result in higher QAC concentrations in wastewater, which is a pathway for broader environmental exposure and potential risks to biota.
>
> "This is especially concerning given that some environmental concentrations already exceed protective aquatic toxicity thresholds."

Flame retardants associated with neurodevelopmental disorders

The Case Western Reserve University researchers also analyzed levels of BDCIPP in children. Data from 1,763 children between the ages of 3 to 11 revealed that nearly all had BDCIPP in their urine.

However, Science Alert reported:

> "Those with the highest levels were two and six times more likely than those with low exposure to experience adverse neurodevelopmental outcomes such as motor dysfunction or requirements for educational assistance."

Past research also linked greater exposures to flame retardants during pregnancy with lower intelligence in the child. Specifically, for every 10-fold increase in prenatal exposure to another type of flame retardant, polybrominated diphenyl ethers, there was a 3.7-point decline in IQ test scores in children.

Past research has also demonstrated that children born to mothers with higher levels of flame retardant chemicals in their body had a 4.5-point average decrease in IQ, while exposure in childhood is strongly associated with poor attention span, reduced fine motor coordination and a decrease in cognitive ability.

Flame retardants may even change important processes, including tryptophan metabolism, in the placenta that can affect the developing brain.

"Our findings suggest that more comprehensive scrutiny of the impacts of these common household chemicals on brain health is necessary," Tesar said in a news release.

"We hope our work will contribute to informed decisions regarding regulatory measures or behavioral interventions to minimize chemical exposure and protect human health."

What else is lurking in hand sanitizer?

The U.S. Food and Drug Administration (FDA) maintains a running list of "hand sanitizers consumers should not use."

It includes products that were tested by the FDA and found to contain benzene, acetaldehyde, methanol, acetal or other toxins.

Others on the list were found to have microbial contamination, were made at the same facility as products that contain benzene and other toxins or were packaged in containers resembling food or beverage containers, posing an increased risk of accidental ingestion.

Valisure laboratory also tested 260 hand sanitizer products, including liquid and non-liquid products. They found that 44 batches, or 17%, contained benzene.

The highest benzene level detected was 16.1 parts per million (ppm), which is more than eight times the FDA's interim limit of 2 ppm.

Benzene is found in crude oil, gasoline and cigarette smoke, and is also widely used to make chemicals used in the manufacture of plastics, synthetic fibers, lubricants, rubbers, dyes, detergents, drugs and pesticides.

Benzene interferes with cells, causing bone marrow to not produce enough red blood cells, triggering anemia, for instance. It can also cause immune system damage, including changes in antibody levels and loss of white blood cells.

After long-term exposure, benzene causes cancer in humans, particularly leukemia, and is known to lead to irregular menstrual periods and a decrease in ovary size in women.

In their guidance on how to use hand sanitizer safely, the FDA also states that hand sanitizers are drugs, which can cause alcohol poisoning in children if even a small amount is consumed.

Writing in Critical Reviews in Toxicology, researchers with Vellore Institute of Technology in India called for the development of natural alternatives to replace toxic hand sanitizers, noting:

> "The unintended exposure of children to hand sanitizers poses a high risk of potentially fatal complications.
>
> "Skin irritation, dryness, cracking, peeling, hypoglycemia, apnea, and acidosis are examples of unintended consequences of hand sanitizer. The sanitizer reportedly kills normal microbial flora on hands, which usually promotes innate immunity among children under 12.
>
> "Children are more susceptible to the toxicity associated with the chemical constituents of marketed chemical-based hand sanitizers; however, the studies to develop sanitizer formulations for children are rudimentary. …
>
> "Additionally, it is reported that many chemical-based hand sanitizer formulations, especially alcohol-based ones may also contain contaminants like methanol, acetaldehyde, benzene, isopropanol, and ethyl-acetate."

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Use hand sanitizer sparingly, if at all — wash your hands instead

Overuse of hand sanitizers and other disinfectants can backfire. There are potential adverse effects on human health from inhaling disinfectants, as such chemicals are known to accumulate in the lungs, liver, kidneys, stomach, brain and blood.

Exposures were certainly elevated during the pandemic for many people, who were exposed to disinfectants by inhalation and oral routes, as well as via the skin and eyes.

There are also significant environmental concerns due to the "unusual release and dissemination of higher concentrations of biocide-based products into the surface and underground waters and also wastewater treatment systems."

When disinfectants and biocides enter the environment, they can wipe out beneficial bacterial species that are keeping drug-resistant microorganisms in check.

"If the biocide concentrations reach the sub-minimum inhibitory concentration (sub-MIC), this event may augment the selective pressure, boost the horizontal gene transfer (HGT), and drive the evolution of AMR [antimicrobial resistance]," scientists warn.

Remember, there is little hand sanitizers and disinfectant wipes can do that soap and water cannot. Unless you're in a hospital setting, where disinfectants are sometimes necessary, you should use hand sanitizers sparingly and only when truly necessary, which typically will be hardly at all.

In most cases, simple hand washing is all that is necessary to keep your hands clean.

In a study that compared the effect of alcohol-based hand sanitizer and hand washing using ozonized tap water or soap and water to remove E. coli, washing with soap and water was the most effective.

As an added bonus, one week of hand washing reduced individual exposure to flame retardants by about half.

House cleaning for one week to reduce dust was also an effective way to significantly reduce exposure to dangerous flame retardant chemicals.

Originally published by Mercola.

The views and opinions expressed in this article are those of the authors and do not necessarily reflect the views of Children's Health Defense.

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April 2, 2024 Disinfectant Chemicals Could Damage Critical Supporting Cells In The Brain

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https://www.sciencealert.co...

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During the prolonged flu season of 2020-2022 my health insurance folk sent me a care package that included some hand "sanitizer".

"99.9% effective in killing common household bacteria" "Cleanitize" was the brand name.

On the lower left corner of the front of the package was this warning: "Keep Out Of Reach Of

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